CHAPTER 5

EMPLOYMENT

Overview

Differences in participation of women, minorities, and persons with disabilities in science and engineering employment are rooted in differences in their current and historic participation in science and engineering education. As previous chapters show, the proportions of science and engineering degrees earned by women and minorities have increased over time. Because the science and engineering labor force is comprised of people who received their degrees from about the 1940s to the present and because women and minorities were a smaller percentage of earlier years' degree recipients, women and minorities are a smaller percentage of the labor force as a whole than they are of current degree recipients.

Text table 5-1.
Percentage of scientists and engineers in the labor force who are women: 1993, 1995, and 1997

Occupation	1993	1995	1997
Total scientists and engineers	22.8	22.4	22.8
Computer/mathematical scientists	30.7	28.9	27.3
Life and related scientists	34.3	34.9	36.2
Physical and related scientists	21.5	21.6	21.9
Social and related scientists	50.5	49.9	52.1
Engineers	8.6	8.6	9.1

SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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Trends in science and engineering employment, 1993–97[1]

Women

Women constituted 23 percent of the science and engineering[2] labor force (that is, those who are either employed or seeking work) in 1997. (See text table 5-1 and appendix table 5-1.) Among recent graduates (those who graduated in 1990 or later), women represented 30 percent of the science and engineering labor force. (See text table 5-2.) Short-term trends show the same percentage of women participating in the science and engineering labor force in 1993 as in 1997. (See text table 5-1.) Women accounted for approximately the same percentages of life scientists, physical scientists, social scientists, and engineers in 1993 and 1997. They comprised a slightly smaller percentage of computer and mathematical scientists in 1997 than in 1993.[3]

Both the numbers and percentages of female doctoral scientists and engineers in the United States increased from 1993 to 1997. As a proportion of all doctoral scientists, women increased from 23 to 26 percent between 1993 and 1997; as a proportion of doctoral engineers, they increased from 4 to 6 percent (NSF 1999a).

[1] Much of the data in this chapter come from the National Science Foundation's SESTAT (Scientists and Engineers Statistical Data System) surveys. (See appendix A for a description of the SESTAT population and information relating to standard errors of the estimates from these surveys.) Because changes were made in these surveys over time in response to user requests for improvements, long-term trend data on science and engineering employment are not available; comparisons can be made, however, between 1993 and 1997.

[2] Throughout this chapter, scientists and engineers are defined in terms of occupation, not degree field. See appendix A for the SESTAT classification of science and engineering and non-science and -engineering occupations. The term "scientists and engineers" includes all people who were employed in a science or engineering occupation and who have ever received a bachelor's degree or higher in a science or engineering field, plus those people holding a non-science and -engineering bachelor's or higher degree who were employed in a science or engineering occupation.

[3] The difference is significant at the 95 percent confidence level.

Text table 5-2.
Percentage distribution of scientists and engineers in the labor force, by sex, race/ethnicity and disability status: 1997

Sex, race/ethnicity, and disability status	Recent graduates [1]	Total labor force
Sex		
Men	70.5	77.2
Women	29.5	22.8
Race/ethnicity		
White, non-Hispanic	76.0	82.8
Asian/Pacific Islander	14.8	10.4
Black, non-Hispanic	4.2	3.4
Hispanic	4.4	3.1
American Indian/Alaskan Native	0.5	0.3
Disability status		
Persons without disabilities	97.1	94.4
Persons with disabilities	2.9	5.6

[1] Recent graduates are those who graduated in 1990 or later.

SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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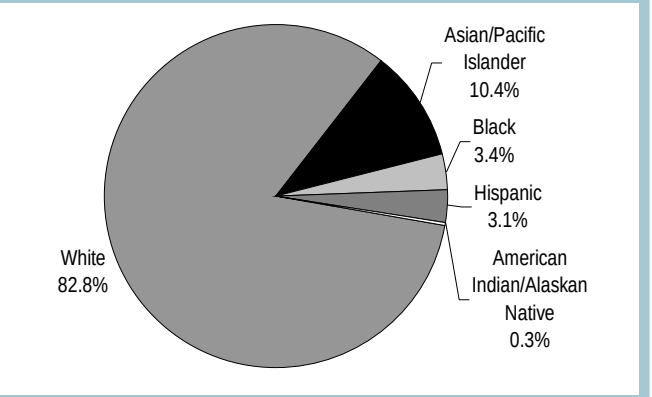
Figure 5-1.
Scientists and engineers in the U.S. labor force, by race/ethnicity: 1997



NOTE: "Other" race/ethnicity included with American Indian/Alaskan Native.

SOURCE: National Science Foundation, Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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Text table 5-3.
Percentage distribution of scientists and engineers in the labor force, by race/ethnicity: 1993, 1995, and 1997

Race/ethnicity	1993	1995	1997
White, non-Hispanic	83.9	83.8	82.8
Asian/Pacific Islander	9.2	9.7	10.4
Black, non-Hispanic	3.6	3.4	3.4
Hispanic	3.0	2.8	3.1
American Indian/Alaskan Native [1]	0.3	0.3	0.3

[1] "Other" race/ethnicity included with American Indian/Alaskan Native.

SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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Minorities[4]

Asians made up 10 percent of all scientists and engineers in the United States in 1997. Blacks and Hispanics were each about 3 percent, and American Indians were 0.3 percent of the country's scientists and engineers. (See figure 5-1, text table 5-2, and appendix table 5-2.) The percentage distribution of scientists and engineers in the labor force by race/ethnicity changed little between 1993 and 1997, with the exception of a slight increase in the percentage who are Asian and a slight decrease in the percentage who are white. (See text table 5-3.)

Minority women

Twenty percent of all women in the science and engineering labor force are minority women; they accounted for 4.6 percent of all scientists and engineers in the labor force in 1997. (See appendix table 5-3.) More specifically, black women were 1 percent, Hispanic women 1 percent, American Indian women 0.1 percent, and Asian women 2 percent of the scientists and engineers in the labor force.

Within every racial/ethnic group, women were a smaller percentage of the science and engineering labor force than were men. These figures are about the same as in 1993. (See text table 5-4.)

Persons with disabilities

Persons with disabilities also make up only a small percentage of those in science and engineering occupations. In 1997, they were 6 percent of the scientists and engineers in the labor force; this was about the same as in 1993. (See text table 5-5 and appendix table 5-4.)

[4] Unlike the previous chapters, racial/ethnic groups are here not restricted to U.S. citizens and permanent residents. Persons with temporary visa status, however, are not likely to be employed; fewer than 2 percent of all people employed in science and engineering occupations have temporary visas.

Measuring Disabilities for People in the Labor Force

As noted in chapter 2, there is no consensus on the definition of disabilities. Therefore, in examining statistics related to disabilities, it is necessary to understand the definition used to compile the data.

The National Science Foundation's surveys used a functional definition of disability patterned after one developed for a survey of individuals with disabilities by the Census Bureau. This measure was based on asking individuals, "What is the USUAL degree of difficulty you have with [specific tasks involving seeing, hearing, walking, and lifting]?" (The full wording of these alternatives in the survey forms is "SEEING words or letters in ordinary newsprint [with glasses/contact lenses if you usually wear them]," "HEARING what is normally said in conversation with another person [with hearing aid, if you usually wear one]," "WALKING without assistance [human or mechanical] or using stairs," "LIFTING or carrying something as heavy as 10 pounds, such as a bag of groceries.") Respondents were given five choices for each item, ranging from "none" to "unable to do." Unless elsewhere noted, having a disability is defined for this survey as having at least moderate difficulty in performing one or more of these tasks.

Although this definition was designed to provide a relatively objective measure of disability, it is important to note that it does not capture all disabilities. For example, learning disabilities and behavioral disorders are not included.[5]

[5] Additional measures of types of disability were omitted from the surveys due to practical limitations. The disability questions included in the questionnaires were considered burdensome and intrusive by many respondents. The survey designers were concerned that additional questions in this area would have a serious negative impact on overall response rate and survey validity—particularly if the surveys requested information on highly sensitive disabilities.

Text table 5-4.
Percentage of scientists and engineers in the labor force, by sex and race/ethnicity: 1993, 1995, and 1997

Sex and race/ethnicity	1993	1995	1997
Total	100.0	100.0	100.0
Women			
White, non-Hispanic	18.5	18.2	18.2
Asian/Pacific Islander	2.2	2.2	2.4
Black, non-Hispanic	1.3	1.3	1.2
Hispanic	0.7	0.7	0.8
American Indian/Alaskan Native	0.1	0.1	0.1
Men			
White, non-Hispanic	65.4	65.6	64.5
Asian/Pacific Islander	7.0	7.5	8.0
Black, non-Hispanic	2.3	2.1	2.1
Hispanic	2.2	2.2	2.3
American Indian/Alaskan Native	0.2	0.2	0.2

SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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Text table 5-5.
Percentage distribution of scientists and engineers in the labor force, by disability status: 1993, 1995, and 1997

Disability status	1993	1995	1997
Persons with disabilities	5.1	4.9	5.6
Persons without disabilities	94.9	95.1	94.4

SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

Women, Minorities, and Persons With Disabilities in Science and Engineering: 2000

Demographic characteristics: Age and educational attainment

Women

Differences in age are related to many of the differences in employment characteristics between male and female scientists and engineers. Female scientists and engineers are younger, on average, than men: 35 percent of the women and 27 percent of the men employed as scientists and engineers in 1997 were younger than age 35. (See appendix table 5-5.)

In the science labor force as a whole, about 13 percent of both women and men hold doctorates. (See appendix table 5-1.) However, female scientists have, in many occupations, a lower level of educational attainment than their male counterparts. Among biological scientists, 26 percent of women and 42 percent of men hold doctoral degrees; among chemists, 14 percent of women and 28 percent of men hold doctoral degrees; and among psychologists, 24 percent of women and 40 percent of men hold doctoral degrees. Among engineers, only 4 percent of women and 6 percent of men had doctoral degrees in 1997. The highest degree earned is related to employment, particularly primary work activity and salary—that is,

scientists and engineers with a bachelor's degree often do different kinds of work and earn lower salaries than scientists and engineers with Ph.D.s.

Minorities

The age distributions of racial/ethnic groups among scientists and engineers differ. As noted earlier, these variations are related to differences in employment characteristics. About 27 percent of employed white scientists and engineers were younger than age 35, compared with between 35 and 38 percent of Asian, black, American Indian, and Hispanic scientists and engineers. (See appendix table 5-5.)

The educational attainment of scientists and engineers differs among racial/ethnic groups. Black scientists and engineers have, on average, a lower level of educational attainment than scientists and engineers of other racial/ethnic groups. Black scientists and engineers are more likely than white, Hispanic, or Asian scientists and engineers to have a baccalaureate as their highest degree: 64 percent of black scientists and engineers in the U.S. labor force had a bachelor's as their highest degree compared with 57 percent of all scientists and engineers in 1997. (See appendix table 5-2.)

Persons with disabilities

Scientists and engineers with disabilities are older, on average, than are those without disabilities. Only 11 percent of employed scientists and engineers with disabilities were younger than age 35 in 1997 compared with 30 percent of those without disabilities. Conversely, 66 percent of those with disabilities and 36 percent of those without were age 45 or older. (See appendix table 5-5.)

The percentage of scientists and engineers with disabilities increases with age. More than half of scientists and engineers with disabilities became disabled at age 30 or older. Only 8 percent of those with disabilities had been disabled since birth, and one-third had been disabled before the age of 20. (See appendix table 5-6.)

Scientists and engineers with disabilities do not differ greatly from those without disabilities in terms of their educational background: 15 percent of those with disabilities and 13 percent of those without had a doctorate as their highest degree. (See appendix table 5-4.)

Science and engineering occupation

Women

As with degree fields (see chapters 3 and 4), women and men differ in science and engineering occupation. Women constitute higher percentages of some science and engineering occupations than of others. For example, more than half of all psychologists (63 percent) and sociologists (55 percent) were women, compared with 10 percent of physicists and 9 percent of engineers. (See appendix table 5-1.) Women also constitute higher percentages of some engineering occupations than others; for example, 14 percent of chemical engineers were women, compared with 11 percent of industrial engineers, 9 percent of civil engineers, and 7 percent of electrical engineers.

A dissimilarity index was constructed to measure the amount of similarity or dissimilarity in the distributions of men and women by occupation.[6] Roughly one-third of women would have to switch their occupation to match the distribution of men in the same set of science and engineering occupations. (See text table 5-6.)

Minorities

Black, Asian, and American Indian scientists and engineers accounted for larger percentages of some occupations than of others. (See appendix table 5-2.) Asians represented a lower percentage of social scientists than

[6] The dissimilarity index is a measure of the percentage of female scientists and engineers who would need to switch occupations to match the percentage distribution by occupation of male scientists and engineers. The index is calculated as the sum of the absolute difference between the percentage of female scientists and engineers working in each occupation and the percentage of male scientists and engineers working in each occupation divided by 2.

Text table 5-6.
Indices of dissimilarity in science and engineering occupation, by sex, race/ethnicity, and disability status: 1997

Occupation	Index of dissimilarity
Women	33.6
Black, non-Hispanic	15.9
Hispanic	10.2
Asian/Pacific Islander	16.1
American Indian/Alaskan Native	23.8
Persons with disabilities	7.6

NOTE: The dissimilarity index is a measure of the percentage of scientists and engineers in a group who would need to switch occupational fields to match the percentage distribution by occupation of a referent group. The index is calculated as the sum of the absolute difference between the percentage of scientists and engineers in a particular group working in each occupational field and the percentage of scientists and engineers in the referent group working in each occupational field, divided by 2. The referent group for women was men, the referent group for each racial/ethnic group was whites, and the referent group for persons with disabilities was persons without disabilities.

SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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of other occupations. Specifically, they were 4 percent of social scientists but 11 percent of engineers and 12 percent of computer scientists. Blacks accounted for a higher percentage of social scientists (5 percent) and mathematical scientists (5 percent) than they were of other occupations: they were 1 percent of physicists and political scientists. Hispanics were more proportionally distributed among occupations. They were roughly 2 to 4 percent of scientists and engineers in most occupations.

A dissimilarity index similar to that used for men and women was constructed to measure the amount of similarity or dissimilarity in the distributions of racial/ethnic groups by occupation. The dissimilarity index was highest for American Indians—23.8 percent of American Indians would have to switch their occupation to match that of white scientists and engineers. (See text table 5-6.) The index was lowest for Hispanics—10.2 percent would have to switch their occupation to match the occupational distribution of white scientists and engineers.

Minority women

Higher percentages of female scientists and engineers than of males within each racial/ethnic group were computer scientists, biological scientists, and social scientists; smaller percentages were engineers. Close to half of all male scientists and engineers were in engineering occupations. Among scientists, a higher percentage of men than of women were computer scientists. Asian women differ from women in other racial/ethnic groups in that a relatively small proportion (7 percent) were social scientists, compared with 23 percent or more of women in other racial/ethnic groups. (See appendix table 5-3.)

Persons with disabilities

Persons with and without disabilities do not differ greatly by occupation: 10 percent of both were life scientists and 8 percent of both were physical scientists in 1997. (See appendix table 5-4.) Similar percentages of scientists and engineers with and without disabilities were engineers (42 versus 41 percent), social scientists (11 versus 10 percent), and computer scientists (25 versus 28 percent).

The dissimilarity index for persons with disabilities was fairly low—7.6, indicating that 7.6 percent of scientists and engineers with disabilities would have to switch their occupation to match that of their counterparts without disabilities.[7] (See text table 5-6.)

[7] The dissimilarity index is a measure of the percentage of scientists and engineers with disabilities who would need to switch occupations to match the occupational distribution of scientists and engineers without disabilities. The index is calculated as the sum of the absolute difference between the percentage of scientists and engineers with disabilities working in each occupation and the percentage of scientists and engineers without disabilities working in each occupation divided by 2.

Labor force participation, employment, and unemployment

Women

The labor force participation rates of men and women with current or former science and engineering occupations were similar in 1997—87 percent of women and 88 percent of men were in the labor force (that is, employed or seeking employment). Among those in the labor force, the unemployment rates[8] of female and male scientists and engineers differed: 2.2 percent of women and 1.4 percent of men were unemployed in 1997. (See text table 5-7.) The unemployment rates of women were higher than those of men in each major science and engineering occupation and within most major age groupings. (See appendix tables 5-7 and 5-8.)

Reasons for not working (whether not in the labor force or unemployed) differ in some respects by sex. Women were more likely than men to cite family responsibilities (38 percent versus 2 percent), and men were more likely than women to cite retirement (79 percent versus 23 percent). (See appendix table 5-9.) These differences reflect variations in the age distributions of men and women as well as differing family responsibilities.[9]

Similarly, a higher percentage of female than of male scientists and engineers are employed part time. Of those who were employed, 17 percent of women and 5 percent of men were employed part time. (See appendix table 5-7.) Women who were employed part time were less likely than men to have preferred full-time employment. (See appendix table 5-10.). Also, women who were employed part time were far more likely than men to cite family responsibilities as the reason for their part-time employment: 44 percent of the women working part time and 10 percent of the men cited family responsibilities as the reason for their work status. (See appendix table 5-10.) Thirty-seven percent of men and 5 percent of women cited retirement as the reason for part-time employment. As was the case with unemployment, variations in age distribution of men and women, as well as varying family responsibilities, are factors in part-time employment choices.

[8] The unemployment rate is the ratio of those who are unemployed and seeking employment to the total labor force. Those who are not in the labor force are excluded from the denominator.

[9] See NSF 1996, p. 66, for a discussion of the relationship between unemployment, part-time employment, and the presence of children under the age of 18.

Minorities

Minority scientists and engineers were more likely than whites to be in the labor force (i.e., employed or looking for employment). Between 91 and 94 percent of black, Asian, Hispanic, and American Indian scientists and engineers were in the labor force in 1997, compared with 87 percent of white scientists and engineers. (See text table 5-7 and appendix table 5-7.) Age variations are related to these differences in labor force participation. White scientists and engineers were older, on average, than scientists and engineers of other racial/ethnic groups: 14 percent of white scientists and engineers were 55 or older in 1997, compared with between 7 and 10 percent of Asians, blacks, and Hispanics. (See appendix table 5-5.)

Text table 5-7.
Labor force participation rates and unemployment rates of scientists and engineers, by sex and race/ethnicity: 1997

Sex and race/ethnicity	Labor force participation rate [1]	Unemployment rate [2]
Total	87.8	1.5
Women	86.9	2.2
Men	88.0	1.4
White, non-Hispanic	86.9	1.4
Asian/Pacific Islander	92.8	2.0
Black, non-Hispanic	91.0	1.9
Hispanic	92.4	2.6
American Indian/Alaskan Native	94.5	1.4
White women	86.0	2.0
Nonwhite women	90.4	2.8
White men	87.1	1.3
Nonwhite men	93.1	1.9
Persons without disabilities	89.2	1.5
Persons with disabilities	68.8	2.7

[1] The labor force participation rate is the ratio of those who are either employed or who are unemployed and seeking employment to all scientists and engineers.

[2] The unemployment rate is the ratio of those who are unemployed and seeking employment to the total labor force. Those who are not in the labor force are excluded from the denominator.

NOTES: The term "scientists and engineers" includes all persons who have ever received a bachelor's degree or higher in a science or engineering field, plus persons holding a non-science and -engineering bachelor's or higher degree who were employed in a science or engineering occupation.

SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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Among those in the same age group, the labor force participation rates of white and minority scientists and engineers were similar. (See appendix table 5-7.)

Although nonwhite scientists and engineers were less likely to be out of the labor force than whites, among those who were in the labor force, nonwhite scientists and engineers from some racial/ethnic groups were more likely to be unemployed. In 1997, the unemployment rate of white scientists and engineers was significantly lower than that of Hispanics and Asians. (See text table 5-7 and appendix table 5-7.) The unemployment rate for whites was 1.4 percent, compared with 2.6 percent for Hispanics, 2.0 percent for Asians, and 1.9 percent for blacks.

Minority women

Female Hispanic and Asian scientists and engineers were more likely (90 and 92 percent, respectively) than their white counterparts (86 percent) to be in the labor force. (See appendix table 5-8.) Higher percentages of white women (18 percent) and Hispanic women (17 percent) than of black women (9 percent) or Asian women (8 percent) were employed part time. Because of small sample sizes, it is not possible to examine participation in the labor force for these groups within age categories.

The unemployment rate for white women scientists and engineers was lower than the unemployment rate for all other women: 2.0 percent of white women and 2.8 percent of nonwhite women were unemployed in 1997. (See appendix table 5-8.)

Persons with disabilities

The labor force participation rates of scientists and engineers with and without disabilities were quite different. Almost one-third of scientists and engineers with disabilities were out of the labor force compared with 11 percent of those without disabilities. (See text table 5-7 and appendix table 5-11.) Age accounts for some, but not all, of these differences in labor force participation. Scientists and engineers with disabilities were older than those without disabilities: 46 percent of those with disabilities were 55 or older compared with 19 percent of those without disabilities; older scientists and engineers were likely to be out of the labor force due to retirement. Age, however, does not explain all of the differences in labor force participation. Within age categories, scientists and engineers with disabilities were still more likely than those without to be out of the labor force. For example, among those aged 35 to 44, 8 percent of scientists and engineers with disabilities

were out of the labor force compared with 4 percent of those without disabilities. Among those 55 or older, 60 percent of scientists and engineers with disabilities were out of the labor force compared with 40 percent of those without disabilities.

Although age accounts for some of the tendency for persons with disabilities to be out of the labor force, chronic illness or permanent disability is also a factor. The primary reason for not working for both persons with and without disabilities was retirement (78 and 62 percent, respectively), but 19 percent of persons with disabilities and 2 percent of those without cited chronic illness or permanent disability. (See appendix table 5-9.)

Among those in the labor force, persons with disabilities were more likely than those without to be unemployed. The 1997 unemployment rate for scientists and engineers with disabilities was 2.7 percent compared with 1.5 percent for those without disabilities. (See text table 5-7 and appendix table 5-11.)

Employed scientists and engineers with disabilities were also more likely than those without disabilities to be employed part time: 11.3 percent versus 7.6 percent in 1997.

Sector of employment

Women

Among all employed scientists and engineers, women were less likely than men to be employed in business or industry—46 versus 63 percent—and more likely to be employed in educational institutions—27 percent versus 15 percent of men. These variations by sector, however, primarily stem from differences in occupation. Women were less likely than men to be engineers or physical scientists, occupations that tend to be employed in business or industry. Within occupations, the percentages of men and women employed in industry were similar. For example, among physical scientists, 50 percent of women and 48 percent of men were employed in private for-profit business or industry. (See appendix table 5-12.)

Minorities

Asians were more likely than other racial/ethnic groups to be employed in business or industry. Among employed scientists and engineers in 1997, 64 percent of

Preferences for Academic Versus Industrial Employment Among Recent Recipients of Doctoral Degrees in Science and Engineering

When they begin their doctoral programs in science and engineering, men and women are about equally likely to want to work in academia. Among men and women who received a doctoral degree in science and engineering between 1990 and 1996, about 61 percent of both reported they wanted to work in 4-year colleges or universities when they began their doctoral program. Aside from their academic employment preference, men were more likely than women to want to work in business or industry; women were more likely than men to want to work in "other" employment (including nonprofit organizations, elementary or secondary schools, and self-employment). (See text table 5-8.)

Actual employment outcomes for men and women receiving a doctoral degree in science and engineering between 1990 and 1996 differed from these stated preferences, particularly for men. Within almost all major science and engineering occupations, women were more likely than men to be employed in colleges or universities, and men were more likely than women to be employed in business or industry. The differences between the sector they preferred to work in as they began their doctoral program and the sector they actually worked in after completion of the doctorate were more pronounced for men than for women in colleges or universities and in business or industry. In most doctorate fields, the percentages of women who actually worked in either academia (54.5 percent across all fields) or business/industry (19.8 percent) were closer to the percentages reporting that they desired employment in those sectors (61.2 and 17.7 percent) at the time they started their doctoral program than was the case for men. The percentage of men who actually worked in colleges or universities was smaller than the percentage that desired employment in that sector (44.5 versus 61.0 percent), and the percentage of men who actually worked in business/industry was larger than the percentage that desired employment in that sector (37.7 versus 27.7 percent). Women were thus more likely than men to realize their desire for employment in academia.

Text table 5-8.

Desired versus actual sector of employment for recent science and engineering doctorate recipients, by field of doctorate and sex: 1997

Sector and field of doctorate	Desired sector		Actual sector		Difference	
	Women	Men	Women	Men	Women	Men
College/university [1]						
Total S&E	61.2	61.0	54.5	44.5	6.7	16.5
Computer & information science	73.4	62.0	51.0	35.3	22.4	26.8
Mathematics	85.2	85.0	81.3	56.6	3.8	28.4
Biological/agricultural	72.0	74.0	66.3	63.5	5.6	10.5
Health sciences	70.6	65.5	60.4	57.5	10.2	8.0
Physical and related	54.0	57.1	51.0	39.4	3.1	17.7
Social sciences	77.1	80.3	68.7	63.0	8.4	17.3
Psychology	40.9	45.0	36.9	36.9	4.0	8.1
Engineering	49.4	45.8	34.8	26.3	14.6	19.4
Business/industry [2]						
Total S&E	17.7	27.7	19.8	37.7	2.1	10.0
Computer & information science	22.4	33.5	39.1	56.2	16.7	22.7
Mathematics	11.8	12.3	13.6	28.1	1.9	15.8
Biological/agricultural	20.0	18.3	14.1	19.5	6.0	1.2
Health sciences	10.7	19.6	10.5	18.3	0.1	1.2
Physical and related	40.3	35.3	37.7	44.4	2.5	9.0
Social sciences	6.0	4.7	8.8	14.2	2.8	9.5
Psychology	9.4	11.0	18.4	21.3	9.1	10.3
Engineering	38.6	45.8	51.9	61.6	13.3	15.8
Government						
Total S&E	3.5	4.4	9.0	9.3	5.4	4.9
Computer & information science	2.0	0.8	5.9	3.9	3.8	3.1
Mathematics	0.4	0.9	0.2	5.1	0.2	4.2
Biological/agricultural	3.7	3.7	10.6	9.9	6.9	6.2
Health sciences	6.5	8.4	11.8	12.1	5.3	3.7
Physical and related	2.7	5.4	5.8	9.5	3.1	4.2
Social sciences	5.9	7.6	6.9	10.6	1.0	3.0
Psychology	1.5	2.6	10.3	14.4	8.8	11.8
Engineering	4.0	4.1	6.8	8.0	2.8	3.9
Other [3]						
Total S&E	17.6	7.0	16.8	8.6	0.8	1.6
Computer & information science	2.2	3.7	4.0	4.7	1.8	1.0
Mathematics	2.7	1.8	4.9	10.2	2.2	8.4
Biological/agricultural	4.3	3.9	9.0	7.1	4.7	3.2
Health sciences	12.3	6.5	17.3	12.1	5.0	5.6
Physical and related	3.0	2.2	5.5	6.7	2.5	4.5
Social sciences	10.9	7.5	15.6	12.3	4.7	4.8
Psychology	48.2	41.5	34.4	27.5	13.9	14.0
Engineering	8.0	4.3	6.5	4.1	1.5	0.2

[1] Desired sector is listed as "college or university" which may include 2-year colleges, whereas actual sector is limited to "4-year colleges or universities."

[2] Desired sector is listed as "business/industry" whereas actual sector is listed as "private for-profit company or business."

[3] Includes nonprofit organizations, elementary or secondary schools, those who are self-employed, and other sector.

NOTE: Recent science and engineering doctorate recipients are those who earned their degrees beween June 1990 and June 1996.

SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 Survey of Doctorate Recipients.

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Asian scientists and engineers, compared with 53 percent of black, 55 percent of Hispanic, 47 percent of American Indian, and 59 percent of white scientists and engineers, were employed in for-profit business or industry. (See appendix table 5-12.) Because Asians were more likely to be engineers, they were also more likely to be employed by private for-profit employers. Blacks and American Indians, on the other hand, were more likely to be social

scientists, who are less likely to find employment in business or industry; they were less likely to be engineers, who are more likely to find employment in business or industry.

Black, Hispanic, and American Indian scientists and engineers were also more likely than other groups to be employed in Federal—including military—state, or local government: 22 percent of black, 16 percent of Hispanic, and 19 percent of American Indian scientists and engineers were employed in government in 1997, compared with 13 percent of white and 12 percent of Asian scientists and engineers.

Persons with disabilities

Scientists and engineers with disabilities were less likely than those without to be employed in for-profit business or industry: 53 versus 60 percent in 1997. They were also somewhat less likely to be employed in academia than their counterparts without disabilities: 18 versus 20 percent. (See appendix table 5-12.)

Employment in educational institutions: Type of employing school, rank, and tenure

Women

Women scientists and engineers employed in educational institutions differ from their male counterparts in terms of the type of school by which they are employed and their academic rank and tenure. For instance, among all scientists and engineers employed by this sector in 1997, women were more likely than men to be in primary or secondary schools (11 versus 4 percent). (See appendix table 5-13.) This difference was particularly notable among those with master's degrees. Among scientists and engineers employed in educational institutions whose highest degree was a master's, 21 percent of women and 8 percent of men were employed in primary or secondary schools.

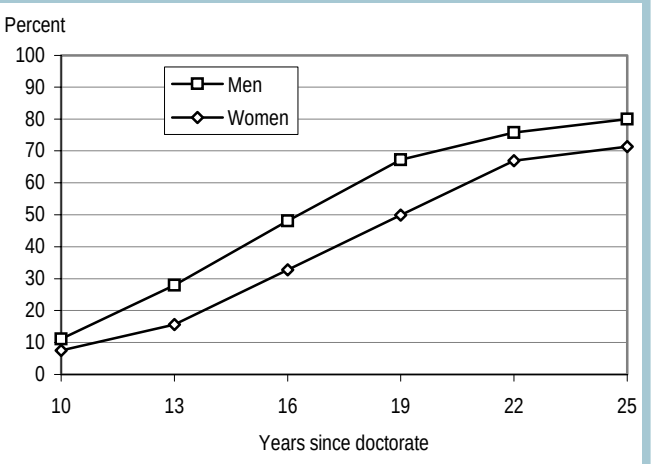
Female scientists and engineers were also more likely than their male counterparts to be employed in 2-year colleges (12 versus 9 percent). (See appendix table 5-13.) These differences in type of educational employer are attributable to differences in highest degree: 69 percent of female and 52 percent of male scientists and engineers employed in educational institutions have a bachelor's or master's degree as their highest degree. More than half of both men and women who are employed in 2-year colleges are employed part time (NSF 1996.)

On the other hand, male and female doctoral science and engineering faculty (full, associate, and assistant professors and instructors) are employed by similar types of institutions. (See appendix table 5-14.) However, within 4-year colleges and universities, female scientists and engineers hold fewer high-ranked positions than do their male counterparts. Women were less likely than men to be full professors and more likely than men to be assistant professors. Among full-time ranked doctoral scientists and engineers, 51 percent of men and 24 percent of women were full professors. Part of this difference in rank is related to age, but differences in the percentages that are full professors exist even after controlling for years since doctorate receipt. (See figure 5-2 and appendix table 5-15.)

Women are also less likely than men to be tenured. Thirty-five percent of female scientists and engineers employed full time in 4-year colleges and universities had tenure compared with 60 percent of men. As was the case with rank, some—but not all—of the differences in tenure may be attributable to differences in years since doctorate receipt. Among those who received their doctorates between 10 and 19 years ago, 58 percent of women and 72 percent of men were tenured. (See appendix table 5-16.)

Among ranked doctoral scientists and engineers employed full time in 4-year colleges or universities, women are as likely as their male colleagues to be supported by

Figure 5-2.
Percentage of full-time ranked doctoral scientists and engineers in 4-year colleges or universities who are full professors, by sex and years since doctorate: 1997



NOTE: Because of small sample sizes, a three-year average is used for years since doctorate.

SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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Federal grants or contracts. Specifically, the work of 34 percent of women and 38 percent of men was supported by Federal grants or contracts. (See appendix table 5-17.)

Minorities

Variations exist across racial/ethnic groups in terms of type of academic employer. Among all scientists and engineers employed by the educational sector in 1997, Asians were less likely than other groups to be employed in primary or secondary schools (1 percent versus between 7 and 10 percent of other groups) or in 2-year colleges (3 percent versus between 10 and 15 percent of other groups). (See appendix table 5-13.) Asian doctoral scientists and engineers also differ from other groups in the Carnegie classification of their academic employer. These doctorate-holders are more likely than their black or Hispanic counterparts to be employed by Research I universities. For their part, black doctoral scientists and engineers are generally less likely than other groups to be employed by Research I universities and more likely than other groups to be employed by Comprehensive I colleges or universities. (See appendix table 5-14.)

Racial/ethnic groups differ in rank and tenure as well. Among full-time ranked doctoral scientists and engineers in 4-year colleges or universities, 37 percent of Asians and 32 percent of both blacks and Hispanics were full professors, compared with 47 percent of whites. These differences are partly related to variations in the number of years since doctorate award. Black, Hispanic, and Asian scientists and engineers tended to be more recent doctorate recipients, on average, than white and American Indian scientists and engineers. When years since doctorate are accounted for, differences in rank and tenure were reduced. Among full-time ranked doctoral scientists and engineers in 4-year colleges or universities who received doctorates between 10 and 19 years ago, 44 percent of Asians and 40 percent of whites and Hispanics were full professors. (See appendix table 5-15.) Among black faculty in that age group, however, 31 percent were full professors.

Black, Hispanic, and Asian doctoral scientists and engineers in 4-year colleges or universities were also less likely than whites to be tenured: 46 percent of blacks, 48 percent of Hispanics, and 37 percent of Asians compared with 57 percent of whites. (See appendix table 5-16.) These tenure differences are also related to differences in years since doctorate receipt. Among scientists and engineers who received their doctorate 10 to 19 years ago, 71 percent of Hispanics, 69 percent of blacks, 66 percent of Asians, and 69 percent of whites were tenured.

Black and American Indian doctoral scientists and engineers employed in 4-year colleges or universities were less likely than other groups to have received Federal grants or contracts. Twenty-nine percent of black and 22 percent of American Indian doctoral full, associate, or assistant professors employed full time in colleges or universities were supported by Federal contracts or grants compared with 37 percent of their white and Hispanic counterparts, and 42 percent of Asians. (See appendix table 5-17.) These differences may be related to the variations in type of academic employer discussed earlier in this chapter.

Minority women

As previously noted, female scientists and engineers are less likely than men to be full professors, and minorities are less likely than whites to be full professors. Not surprisingly then, black, Hispanic, and Asian women are less likely than white women and less likely than men of any racial/ethnic group[10] to be full professors. (See appendix table 5-18.) These rank and tenure variations are once again at least partly related to differences in years since doctorate.

Tenure differences are related to rank. Black, Hispanic, and Asian women are less likely than white women or men of any racial/ethnic group to be tenured. Twenty-nine percent of both black and Hispanic women and 17 percent of Asian women, compared with 38 percent of white women, 63 percent of white men, and between 43 and 53 percent of Hispanic, black, and Asian men held tenure in 1997. (See appendix table 5-19.) The small percentage of Asian women who were tenured is also related to differences in academic position. A relatively larger percentage of Asian men and women were in positions for which tenure does not apply—for example, postdoctoral fellows and nonfaculty research appointments.

Persons with disabilities

Among Ph.D.-holding scientists and engineers employed full time in 4-year colleges and universities, those who have disabilities are more likely than those without disabilities to be full professors and to be tenured. (See appendix tables 5-15 and 5-16.) These differences in rank and tenure between persons with and without disabilities are—as was noted in the discussions of women and racial/ethnic groups—again related to differences in the number

[10] This excludes American Indians, for whom data are unreliable due to small sample size.

of years since doctorate award. Because the incidence of disability increases with age, scientists and engineers with disabilities tend to be older and to have more years of professional work experience than those without disabilities. Among doctoral scientists and engineers employed full time in 4-year colleges or universities with similar years since receipt of doctorate, rank and tenure status were more similar. For example, of those who received their doctorates between 20 and 29 years ago, 85 percent of those without disabilities and 90 percent of those with disabilities were tenured. (See appendix table 5-16.)

Doctoral scientists and engineers with disabilities who were employed full time in 4-year colleges or universities (29 percent) were less likely than those without disabilities (38 percent) to have been supported by Federal grants or contracts. (See appendix table 5-17.)

Nonacademic employment

Women

Within for-profit business or industry, occupational differences are related to variations in primary or secondary work activities between male and female scientists and engineers.[11] For example, men are more likely than women to be engineers and physical scientists, occupations that frequently entail research and development activities. Therefore, it is not surprising that the primary or secondary work activity of female scientists and engineers in business or industry differs from that of their male counterparts: 45 percent of women and 58 percent of men reported research and development as their primary or secondary work activity in 1997. Women, however, are about as likely as men to be in management or administration—43 percent of women and 47 percent of men cited management or administration as their primary or secondary work activity in 1997. (See appendix table 5-20.) Note, however, that among younger scientists and engineers, similar percentages of men and women were in management, while among older scientists and engineers, a higher percentage of men than of women were so engaged. More specifically, among those ages 45 to 54, 50 percent of men and 42 percent of women were in management in 1997.

[11] Reinterview surveys used to evaluate data quality found that while respondents are reasonably consistent in identifying their work activities, they are not consistent in ordering them as either primary or secondary. Therefore, primary and secondary work activities are combined in this analysis.

Women who were supervisors had, on average, fewer total (direct plus indirect) subordinates than did men. The median number of total subordinates for women was 7 compared to 10 for male supervisors. (See appendix table 5-21.) The disparity in number of subordinates is most pronounced among older age groups: among those between the ages of 45 and 54, the median number of subordinates was 8 for women and 14 for men.

Female scientists and engineers in government are less likely than men to be primarily or secondarily engaged in management activities: 46 percent versus 53 percent in 1997. (See appendix table 5-22.)

Minorities

Racial/ethnic groups also differ in some respects in their primary or secondary work activity in for-profit business or industry. Black and Asian scientists and engineers are more likely than other groups to be engaged in computer applications—52 percent of both black and Asian, compared with 41 percent of white and 40 percent of Hispanic, scientists and engineers reported this primary or secondary activity in 1997. (See appendix table 5-20.) Blacks and Asians also are less likely than other groups to be engaged primarily or secondarily in management or administration (41 percent of black and 37 percent of Asian compared with 47 percent of white and 49 percent of Hispanic scientists and engineers). Age differences do not explain this variation in managerial activity. Among 35- to 44-year-olds, blacks and Asians remain less likely to be engaged in management or administration—33 percent of Asians and 42 percent of blacks, compared with 48 percent of whites and Hispanics, were in management or administration in 1997. Among supervisory scientists and engineers, Asians have fewer subordinates than do scientists and engineers from most other racial/ethnic groups. The median number of direct and indirect subordinates was 5 for Asian, 5 for American Indian, 10 for Hispanic and white, and 12 for black scientists and engineers in 1997. (See appendix table 5-21.)

In the government sector, Asian scientists and engineers—regardless of age—are, once again, less likely than scientists and engineers in other racial/ethnic groups to be engaged in management or administration. Forty-four percent of Asian scientists and engineers employed in government, compared with 57 percent of blacks, 55 percent of Hispanics, and 52 percent of whites, reported management or administration as their primary or secondary work activity. (See appendix table 5-22.)

Minority women

Minority female scientists and engineers employed in business or industry report, for the most part, work activities similar to those of white women. Asian women are, however, more likely than women from other racial/ethnic groups to be engaged in research and development and less likely to be engaged in management or administration. In 1997, 52 percent of Asian women compared with 42 to 49 percent of white, black, and Hispanic women were primarily or secondarily engaged in research and development. Thirty-four percent of Asian women compared with from 40 to 50 percent of women in other racial/ethnic groups were engaged primarily or secondarily in management or administration. (See appendix table 5-23.) Regardless of racial/ethnic group, women were more likely than men to report computer applications as a primary or secondary work activity and less likely to report research and development activity.

Persons with disabilities

The type of work that scientists and engineers with disabilities do in for-profit business or industry is similar to that performed by those without disabilities. The primary or secondary work activity of 53 percent of scientists and engineers with disabilities is research and development, compared with 56 percent for those without disabilities. Forty-four percent of scientists and engineers with disabilities and 46 percent of those without were engaged primarily or secondarily in management or administration in 1997. (See appendix table 5-20.) Among those with supervisory responsibilities, persons with and without disabilities had about the same number of subordinates—a mean of 11 and 10 subordinates, respectively. (See appendix table 5-21.) Among scientists and engineers employed in government, 51 percent of those with disabilities and 52 percent of those without were primarily or secondarily engaged in management or administration. (See appendix table 5-22.)

Salaries

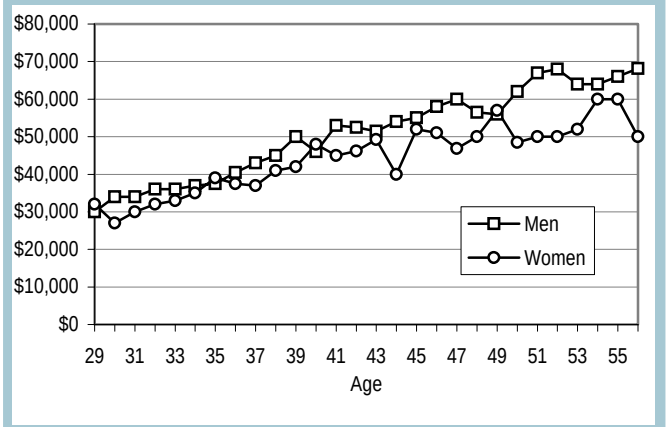
Many factors explain the various differences that exist between the annual salaries of men and women, among racial/ethnic groups, and between persons with and without disabilities employed full time in science and engineering. Three of the most important of these are age, occupation, and highest degree level. Other reports (NSF 1996 and NSF 1999b) provide more detailed explanations of the variety of factors influencing salaries for men and women; the following briefly delineates the issue.

Women

Full-time employed female scientists and engineers generally earn less than men, but these salary differences are due primarily to differences in age, occupation, and highest degree attained. Female scientists and engineers are younger, on average, than men and are less likely than men to be in computer science or engineering—occupations that command higher salaries. The 1997 overall median salary for full-time female scientists and engineers was $47,000; this was much lower than that for men ($58,000), but within occupations and within younger age categories, the median salaries of men and women were more alike. (See appendix table 5-24.) For example, in 1997, among physical scientists aged 20 to 29 with a bachelor's degree, the median salary for women was $27,000; for men it was $29,000. With increasing age, however, the gap in salaries between male and female scientists widens in both the education and business sectors. (See figures 5-3 and 5-4.) On the other hand, for engineers employed in business or industry, men's and women's salaries keep pace with increasing age through age 40.[12] (See figure 5-5.)

[12] Salary comparisons for those older than age 40 were not possible because the number of women engineers in the sample who were older than age 40 was too small.

Figure 5-3.
Median salary of doctoral scientists employed full time in 4-year colleges or universities, by sex and age: 1997



SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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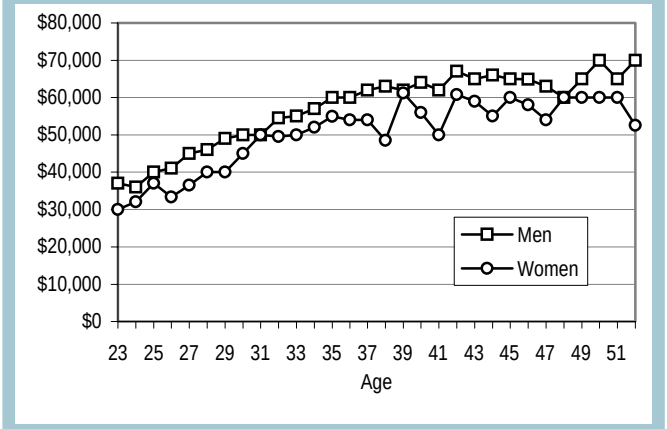
Figure 5-4.
Median salary of scientists employed full time in business or industry, by sex and age: 1997



SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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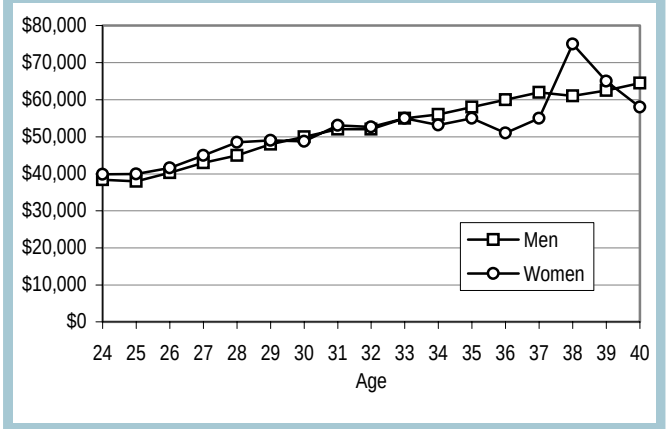
Figure 5-5.
Median salary of engineers employed full time in business or industry, by sex and age: 1997



NOTE: Salary comparisons for those older than age 40 were not possible because the number of women engineers in the sample who were older than age 40 was too small.

SOURCE: National Science Foundation/Division of Science Resources Studies, 1997 SESTAT (Scientists and Engineers Statistical Data System).

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Minorities

Salaries for scientists and engineers differ across racial/ethnic groups. Among all scientists and engineers, the median salaries by racial/ethnic group were $55,000 for whites, $55,000 for Asians, $50,000 for Hispanics, $48,000 for blacks, and $46,000 for American Indians. Within science occupations and age categories, median salaries of scientists and engineers were often lower for blacks, Hispanics, and American Indians than for other groups. (See appendix table 5-25.)

Minority women

Median annual salaries of female scientists and engineers of all racial/ethnic groups were lower than those of male scientists and engineers; this pattern also held true across most broad occupations and age groups. For example, among computer or mathematical scientists in the 20- to 29-year-old age group, median salaries for women were $46,000 for Asians, $40,000 for whites, $38,000 for Hispanics, and $35,000 for blacks. (See appendix table 5-26.) Median salaries for male computer or mathematical scientists in the same age group were $49,000 for Asians, $44,500 for whites, $41,000 for Hispanics, and $38,000 for blacks, respectively. Differences in highest degree (as well as other factors, see NSF 1996) are also likely to influence salaries; however, no adjustment by highest degree was possible for this analysis due to small sample size.

Persons with disabilities

Median salaries of scientists and engineers with disabilities are similar to those for scientists and engineers without disabilities. Among all scientists and engineers, the median salary for those with disabilities is $56,000; for those without, it is $55,000. Salaries differ little within occupations and age groups. For example, the median salary for engineers with a bachelor's degree and between the ages of 20 and 29 is $42,800 for those with disabilities and $40,000 for those without disabilities. (See appendix table 5-27.)

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